

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
31 March 2005 (31.03.2005)

PCT

(10) International Publication Number
WO 2005/029626 A3

(51) International Patent Classification:

H01M 8/04 (2006.01) H01M 4/86 (2006.01)
H01M 16/00 (2006.01) H01M 8/02 (2006.01)
C09K 5/12 (2006.01)

(21) International Application Number:

PCT/US2004/030214

(22) International Filing Date:

15 September 2004 (15.09.2004)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

10/662,561 15 September 2003 (15.09.2003) US

(71) Applicant (for all designated States except US): INTEL CORPORATION [US/US]; 2200 Mission College Boulevard, Santa Clara, CA 95052 (US).

(72) Inventors (for US only): ROCKE, Michael; 1060 Lakeview Court, Argyle, TX 76226 (US). POKHARNA, Himanshu; 439 Camille Circle, #13, San Jose, CA 95134 (US). DISTEFANO, Eric; 1535 Frankfurt Way, Livermore, CA 94550 (US).

(74) Agents: LEMOINE, Dana, B. et al.; Lemoine Patent Services, PLLC, c/o Portfolio IP, P.O. Box 52050, Minneapolis, MN 55402 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

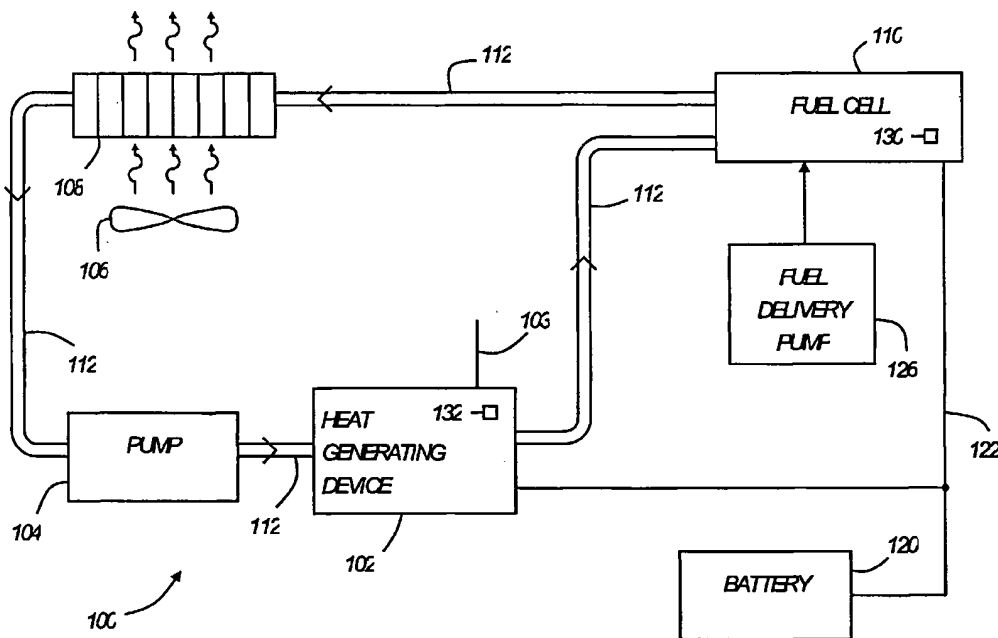
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

[Continued on next page]

(54) Title: INTEGRATED PLATFORM AND FUEL CELL COOLING



(57) Abstract: A fuel cell and a platform associated with the fuel cell include a common fluid cooling system. An apparatus comprising : a fuel cell; an integrated circuit; and a cooling system to cool the fuel cell and the integrated circuit; wherein the cooling system includes a fluid medium to remove heat from the fuel cell and the integrated circuit. The fluid medium may comprise a liquid metal.

WO 2005/029626 A3



— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(88) Date of publication of the international search report:
20 April 2006

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/030214

A. CLASSIFICATION OF SUBJECT MATTER H01M8/04 H01M16/00 C09K5/12 H01M4/86 H01M8/02		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) H01M C09K		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, WPI Data, PAJ		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/157386 A1 (GOTTMANN MATTHIAS ET AL) 21 August 2003 (2003-08-21) paragraphs '0066! - '0079!	1-10, 12, 20-34
X	US 2002/011327 A1 (FUKAZU TOMOHIRO ET AL) 31 January 2002 (2002-01-31) paragraphs '0004!, '0007! - '0029!, '0039!	1-10, 12, 20-34 13-19
Y		
X	US 2002/182462 A1 (BALLANTINE ARNE W ET AL) 5 December 2002 (2002-12-05) paragraphs '0038!, '0046!	1-10, 12, 20-34
	-/-	
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "!" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family		
Date of the actual completion of the international search 20 February 2006		Date of mailing of the international search report 03. 03. 2006
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer Standaert, F

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US2004/030214

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	HAHN R ET AL: "Thermal management of portable micro fuel cell stacks" 19TH ANNUAL IEEE SEMICONDUCTOR THERMAL MEASUREMENT AND MANAGEMENT SYMPOSIUM. SEMI-THERM. PROCEEDINGS 2003. SAN JOSE, CA, MARCH 11 - 13, 2003, IEEE SEMICONDUCTOR THERMAL MEASUREMENT AND MANAGEMENT SYMPOSIUM. SEMI-THERM, NEW YORK, NY : IEEE, US, 11 March 2003 (2003-03-11), pages 202-209, XP010747020 ISBN: 0-7803-7793-1 page 206, left-hand column	1-12, 20-34
A	US 6 175 495 B1 (BATCHELDER JOHN SAMUEL) 16 January 2001 (2001-01-16) column 11, line 8 - line 28	1-12, 20-34
Y	US 5 252 410 A (WILKINSON ET AL) 12 October 1993 (1993-10-12) column 3, line 17 - line 31	13-19
A	US 4 664 988 A (SHIGETA ET AL) 12 May 1987 (1987-05-12) column 2, line 58 - line 68	13-19
A	US 3 660 166 A (AUGUST WINSEL) 2 May 1972 (1972-05-02) abstract	13-19

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2004/030214

Box II Observations where certain claims were found unsearchable (Continuation of Item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.: _____
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.: _____
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.: _____
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-12 and 20-34

An apparatus comprising:

a fuel cell;
an integrated circuit; and
a cooling system to cool the fuel cell and the integrated circuit;
wherein the cooling system includes a fluid medium to remove heat from the fuel cell and the integrated circuit.

2. claims: 13-19

An apparatus comprising:

a fuel cell having an electrode with passageways through which a fluid cooling medium can pass; and
a fluid path adapted to be coupled to the passageways and to a heat generating device other than the fuel cell.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US2004/030214

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2003157386	A1	21-08-2003	NONE	
US 2002011327	A1	31-01-2002	JP 2002046482 A	12-02-2002
US 2002182462	A1	05-12-2002	US 2004096713 A1	20-05-2004
US 6175495	B1	16-01-2001	NONE	
US 5252410	A	12-10-1993	AU 3054092 A WO 9409519 A1	09-05-1994 28-04-1994
US 4664988	A	12-05-1987	CA 1259100 A1 DE 3512865 A1 FR 2562721 A1 GB 2158286 A US 4956131 A	05-09-1989 24-10-1985 11-10-1985 06-11-1985 11-09-1990
US 3660166	A	02-05-1972	BE 694412 A CH 469368 A DE 1671476 B1 FR 1514681 A GB 1169812 A NL 6701326 A SE 311013 B	31-07-1967 28-02-1969 30-12-1971 23-02-1968 05-11-1969 18-09-1967 27-05-1969